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Dr. S. Monckton Copeman's Report on an
Outbreak of Enteric Fever in the Borough
of Harwich and its neighbourhood, 1912-13.



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Dr. S. Monckton Copeman's Report on an Outbreak of Enteric Fever in the Borough of Harwich and its neighbourhood, 1912-13.

ARTHUR NEWSHOLME,
Medical Officer,
7th August, 1913.

In consequence of the receipt of a telegram from the Board, while in Suffolk for the purposes of other official work, instructing me to investigate the circumstances of an outbreak of enteric fever in Harwich, I visited that town on January 16th, 1913, and on subsequent occasions.

On arrival at Harwich I was met by Dr. Gurney, Medical Officer of Health for the Borough, and conferred at the Guildhall with Mr. Ward, the Town Clerk, and other officials and members of the Town Council, and, later, with Dr. Cook, Medical Officer of Health for the Tendring Rural District Council.

I learnt from Drs. Gurney and Cook that since the beginning of December, 1912, a number of cases of enteric fever had appeared, not only in the Borough of Harwich (which includes the seaside resort of Dovercourt), but also in Parkeston, distant about a couple of miles from Harwich and one mile from Dovercourt, which, although an urban area practically forming a suburb of Harwich, is, in respect of sanitary administration, a constituent portion of the Tendring Rural District.

Parkeston, which derives its name from a former Chairman of the Great Eastern Railway, consists for the most part of a somewhat dense aggregation of artisan dwellings inhabited by families directly or indirectly dependent for their living on the harbour and other works in connection with the railway. It, indeed, constitutes the headquarters of the Great Eastern Railway Continental traffic between Harwich and Antwerp and the Hook of Holland. Immediately adjoining the station platform is an hotel, also owned by the Great Eastern Railway Company, the principal visitors to which are travellers breaking their journey to or from the Continent. It was, as I subsequently learned, among the employees of this hotel that the first three cases of enteric fever, reported from the Parkeston area of the Tendring Rural District had occurred.

In a report which he had submitted to the Tendring Rural District Council on the day previous to my first visit, Dr. Cook set out the result of enquiries which he had made as to a number of cases of enteric fever in the Parkeston area of his district. In this report he stated that the only common factor that could be discovered was that all the Parkeston cases, as well as several cases

at Harwich, of the occurrence of which he learnt from Dr. Gurney, obtained their milk supply from one particular dairy farm. Dr. Cook's report, a copy of which was subsequently received by the Board, included a tabular list of ten cases of enteric fever which had already been notified, together with certain explanatory details, especially as regards probable date of onset of illness in each instance.

As regards the cases that had, up to this date, been notified in Harwich and Dovercourt, Dr. Gurney was able to state, as the result of special enquiries on the point, that in all the more recent instances reported to him, the milk supply was being obtained, either wholly or in part, from the particular dairy farm referred to by Dr. Cook. Dr. Gurney further stated that he had been informed that cases of enteric fever had also appeared on H.M.S. "Cherwell," a unit of the 9th destroyer flotilla, then stationed in Harwich Harbour; and that he had been in communication with the senior medical officer in charge, as it seemed not improbable that these cases were in some way causally related to those which had recently been notified (on shore) in Harwich, Dovercourt and Parkeston.

Enteric Fever in the Borough of Harwich prior to the Outbreak.

The Borough of Harwich had been comparatively free from enteric fever prior to the outbreak under investigation, only four cases of the disease having been notified during the year 1911, and eight cases during 1912. Of these eight, however, two only (one notified in the week ending January 20th, 1912, and the other in the week ending September 21st, 1912) occurred prior to the last fortnight in December.

The first cases of enteric fever notified in the Borough of Harwich subsequent to the week ending September 21st, 1912, were confined to a couple of dwellings in a somewhat isolated group of more or less insanitary property overlooking the harbour, and known as Hill Cottages. From these houses six cases were notified between December 15th and 24th; three of the six on the date first mentioned. Four of the six cases lived in one of the cottages invaded; the fifth case was that of an infant aged 15 months, which just before its illness had been living in the same cottage; while the remaining case, a girl aged 12½ years, living in the adjoining cottage, was the daughter of a woman who had been working next door, and having most of her meals there for the previous eight months. The first four of these cases were two sisters and their respective husbands, who all lived in one cottage rented by the women's father. The fifth case was the child of one of these couples. As regards the source of infection, the dates on which the several patients first became ill are consistent with disease having been contracted, in five of the cases, by personal contact with one of the women,* whose attack probably

* The milk consumed was said to have been obtained from a source not under suspicion as having contributed to the spread of enteric fever, but as a child was usually sent to fetch the milk, and as a shop at which not only milk from the infected supply but also "sweets" were retailed is nearer to Hill Cottages than that from which the milk is supposed to have been obtained, the possibility of infection from the milk supply could not definitely be excluded.

dated from about the end of November. The next case followed after an interval of about ten days, while as regards the last of the six to be attacked—the girl living next door—her illness is believed to have commenced a few days prior to Christmas. Careful enquiry failed to disclose the origin of the initial infection in this Hill Cottages group of cases. The facts were difficult to ascertain, as the first case had proved fatal.

The next case to be notified in Harwich (on December 28th, 1912) after the Hill Cottages group, had only just removed from the Tendring Rural District. Then followed a series of notifications from January 3rd onwards, all of which, as the result of subsequent investigation, proved to be related to specific infection of a particular milk supply—secondary cases subsequently coming under observation in certain instances.

Enteric Fever in Tendring Rural District (Parkeston) prior to the Outbreak.

As previously stated, Parkeston, which has suffered, in proportion to population, more heavily than Harwich and Dovercourt during the past three months, although adjoining the Borough, is situated in the Tendring Rural District, a fact which has given rise to some difficulty during the course of investigation of the outbreak and in the taking of the steps necessary for preventing spread of the disease, especially in the case of individuals moving from one district to the other. The total number of cases notified in the Tendring Rural District during the past five years is as follows:—

Year.	Number of cases of Enteric Fever notified.					
1908	2
1909	15
1910	6
1911	32
1912	5

Of the 32 cases notified in 1911 no less than 20 occurred at the village of Ramsay, about four miles from Dovercourt. In his Annual Report for 1911 Dr. Cook, referring to this outbreak, states that it was traced to infection of a local milk supply, and that the outbreak came to an end shortly after the milk supply was discontinued. To this particular outbreak, in its possible relation to that now reported on, it will be necessary to refer later on in this report.

During the year 1912 the total number of cases of enteric fever notified in the Tendring Rural District was as follows:—

Week ended.	Number of cases notified.					
January 6th	2
February 3rd	1
May 11th	1
December 7th	1

From which it will be seen that no cases of the disease had been notified for a period of seven months prior to the appearance of what may be regarded as the first cases of the outbreak now under consideration.

Enteric Fever during the Outbreak, in both districts.

During the outbreak reported on, the total number of cases of enteric fever ascertained, down to May, 1913, including secondary cases, has been :—

	Cases.	Deaths.
Harwich Borough (including Dovercourt) ...	44	4
Tendring Rural District (Parkeston and Ramsay)	25	2
H.M.S. "Cherwell" (including an additional unnotified case discovered as the result of blood-serum examinations) ...	4	1
	—	—
Total	73	7
	—	—

The *dates* of notified cases are practically useless for the purpose of determining the period over which the presumed cause of the outbreak was operative, for the reason that, many of the attacks being comparatively mild, in several instances the services of a medical practitioner were not called in for several weeks after the patient had first been taken ill. The later cases include cases which were discovered during a house-to-house visitation of certain areas of the Borough, carried out on my recommendation. The actual nature of the disease from which these "missed" cases were suffering was in each instance confirmed by blood examinations for the Widal reaction. Certain of these cases were, in the first instance, believed to be suffering from influenza, while, in others, the symptoms, for a considerable period, at any rate, were so slight that the individuals concerned had been going about their ordinary avocations.

Enquiry was therefore directed to determination, as nearly as possible, of the date on which, in each instance, definite illness commenced.

In the following tabular statement the dates thus obtained are set out, but, for the reason stated above, the record cannot be regarded as altogether reliable. In a few cases, as will be seen from gaps in the table, not even an approximate date could be obtained.

TABLE SHOWING APPROXIMATE DATE OF ONSET OF ILLNESS.

Harwich Borough (including Dovercourt).

Date.						Number of cases.
1912—						
November 30th	...	...	...	...	...	1
December 6th	...	...	...	...	...	1
„ 11th	...	...	...	...	...	2
„ 20th	...	...	...	...	...	2
„ 21st	...	...	...	...	...	1
„ 25th	...	...	...	...	...	3
„ 27th	...	...	...	...	...	1
„ 28th	...	...	...	...	...	2
„ 30th	...	...	...	...	...	1
Between November 25th and December 28th						1
1913—						
January 1st	...	...	...	...	...	1
„ 3rd	...	...	...	...	...	1
„ 4th	...	...	...	...	...	2
„ 6th	...	...	...	...	...	1
„ 11th	...	...	...	...	...	2
„ 15th	...	...	...	...	...	2
“ Much prior to January 29th ”					...	1
						—
						25
Secondary cases*	...	...	...	...	...	19
						—
Total	...	...	...	...	...	44
						—

Tendring Rural District (Parkeston and Ramsay).

Date.							Number of cases.
1912—							
November 19th (Ramsay)	...	...	...	...	...	...	1
December 15th	...	...	...	...	...	...	1
„ 18th	...	...	...	...	...	...	1
„ 20th	...	...	...	...	...	...	1
„ 28th	...	...	...	...	...	...	1
„ ?	...	...	...	...	...	...	1
„ ?	...	...	...	...	...	...	1

* These include all cases occurring in an invaded house, or court, 14 days or more after the primary case.

1913—

January 1st	...	...	...	...	...	...	3
„ 4th	...	...	...	...	...	...	1
„ 6th	...	...	...	...	...	...	1
„ 9th	...	...	...	...	...	...	1
„ 10th	...	...	...	...	...	...	1
„ 11th	...	...	...	...	...	...	1
„ 13th	...	...	...	...	...	...	2
„ 15th	...	...	...	...	...	...	1
„ 16th	...	...	...	...	...	...	1
„ 22nd	...	...	...	...	...	...	1
Prior to January 25th	...	...	...	...	...	...	1
							—
							21
Secondary cases	...	...	...	...	...	...	4
							—
Total	...	...	...	...	...	...	25
							—

H.M.S. “Cherwell.”

Date.							Number of cases.
1912—							
December 26th	...	...	...	...	...	...	1
„ 30th	...	...	...	...	...	...	2
1913—							
January 10th (notified on this date but ill several days previously)	...	...	...	...	...	...	1
							—
Total	...	...	...	...	...	...	4
							—

Age and Sex Incidence.

In the accompanying tabular statement the number of patients attacked by enteric fever is set out in successive quinquennial periods up to the age of 25, above which age all other cases are included in one group. The numbers for Harwich and Dovercourt (Borough of Harwich) and for the Tendring Rural District (Parkeston) are set out separately.

—	Under 5 years.	10 years.	15 years.	20 years.	25 years.	Over 25 years.
Harwich. Population (1911), 13,622.	} 5	5	3	10	8 (1)	13 (3)
Parkeston. Population (estimated), 1,820.	} 3	5	1	3	4	9 (2)

The figures in parentheses refer to deaths. In addition to the two fatal cases at Parkeston, a woman died as a result of

suicide while suffering from an attack of enteric fever. One officer on H.M.S. "Cherwell" also died after removal to Chatham Naval Hospital.

The incidence on sex has been as follows:—

						Males.	Females.
<i>Harwich</i>	...	...	...	...	...	28	16
<i>Parkeston</i>	...	...	...	...	...	13	12
						—	—
Total	...	...	...	...	...	41	28
						—	—

This excess of attacks of males over females is unusual, but may in part, at any rate, be accounted for by the fact that, for reasons given below, certain employees of the Great Eastern Railway, most of whom live in Harwich although working at Parkeston or on the ships and railway restaurant cars belonging to the company, were specially exposed to infection, and these persons were principally males. If the employees attacked be excluded from the total, the figures for the two sexes become:—Males, 28; females, 25, respectively.

CAUSATION OF THE OUTBREAK.

Although from an early stage of the outbreak, except indeed as regards the first group of cases notified in the Borough of Harwich, fairly definite indications of causal relationship between incidence of enteric fever and the area of supply of one particular milk purveyor were forthcoming, investigation of other possible sources for the spread of infection of this disease was not neglected.

The *water supply* of Harwich and Dovercourt, as also of Parkeston, is obtained from deep wells at Mistley and Lawford, near Manningtree, owned by a private company. The water, which, though hard, is very pure, is derived from the chalk. The pumping station is at Lawford, whence the water is delivered into a main which branches at Wix—one branch (*a*) delivering to Harwich, Dovercourt, and Parkeston, while the other (*b*) goes by way of Thorpe to Frinton, Walton-on-the-Naze, Little Clacton, and Great Holland, joining the Frinton main again at Kirby Cross. Parkeston is supplied by means of a branch from the chief main which feeds a reservoir from whence the Harwich and Dovercourt water supply is drawn. It will be observed that no cases of enteric fever have been reported for some considerable time past from any part of the area supplied by the Thorpe, Frinton, and Walton mains. And as regards Harwich and Dovercourt, whereas the water supply is practically universal, the only areas affected with enteric fever were those included in the milk round from a particular dairy farm. Hill Cottages, where the first group of Harwich cases occurred, obtained their drinking supply from a local well. Then again, the naval flotilla stationed at Harwich obtains its drinking water not from Harwich, but from Felixstowe, from which place also during the past year no cases of enteric fever have been notified. The only ship to be affected—H.M.S.

“Cherwell”—turns out, so far as can be ascertained, to be the only one to have obtained milk on one or more occasions from Parkeston.

Although due enquiry was made, no evidence whatever was obtained tending to indicate that oysters or other shell-fish, fried fish, or uncooked fruit and vegetables were concerned in the spread of infection.

The Implicated Milk Supply.

On learning the result of Dr. Cook's preliminary investigations, I interviewed Mr. R., executor for the former owner of the milk business in question, and arranged with him to visit the farm (No. 1) where the milk was produced, and also another farm (No. 2) in the same ownership, to which, as I learnt, the milk was taken, in the first instance, for the separation of a certain amount of cream for butter making, and from which farm it was subsequently distributed. Accompanied by Dr. Gurney and Mr. R., I first visited farm No. 2, distant about a couple of miles from Harwich. The dairy, built at right angles to the kitchen of the house, we found to be a fairly large, well-lighted room with concreted floor, containing a mechanical cream-separator and several empty cans. Both inside and outside the dairy a decidedly unpleasant smell reminiscent of stale fish was noticeable. This smell we eventually traced to the “dumping” of house and trade refuse from Harwich, which was in progress on land belonging to the farmer, and within a couple of hundred yards of the dairy.

Farm No. 1 where the milk was produced,* situated about a mile from No. 2, is approached by a long cart track from the main road, which at the date of my visit was deep in mud. In the stock-yard the condition of affairs was so much worse that it was only traversed with considerable difficulty. The stock consisted of 27 cows in all, of which 19 “in milk” were divided between a cowshed containing six animals, and a large barn in which 14 animals were housed, so much of the floor as was occupied by them having recently been concreted. With one exception the cows not “in milk” were on the marshes, where also a bull was kept.

In the barn were found the churns into which the milk is poured direct from the milking pails, hot water for the cleansing of these utensils being brought in pails from the farm-house on the opposite side of the stock-yard. So far as was possible, examination was made of the cows, and especially of their udders, but no definite indication of disease was found; and, as matter of fact, the owner had just obtained a veterinary certificate to the effect that all the stock on the farm were in a healthy condition.

* The milk business has now been discontinued, and all the stock and utensils sold.

Two men who were at work on the premises stated that they constituted the whole of the staff having anything to do with the cows. Further questioning elicited the fact that one of these had only come on the farm about five weeks previously, three weeks prior to which the work had been taken on, temporarily, by a man (J. A. G.) who gave it up at the end of that time.

As this period of three weeks appeared to correspond with a portion, at any rate, of that during which the milk, supposing it to have originated enteric fever in Harwich and Parkeston, must have been potentially infectious, further enquiry was made as to this man's history, present and past, and as it appeared that he was now working at farm No. 2, whither he had transferred at the end of his three weeks' service at farm No. 1, a second visit was made there in order to obtain a personal interview with him. As the result of this and of information supplied by Mr. R. and others, the following facts were elicited:—

J. A. G., aged 32, a married man, has lived practically all his life at Ramsay, a village about a mile distant from farm No. 1. Prior to the last week in November, 1912, he had been engaged in reed-cutting on the marshes included in the farmstead, but was then put on to help in attending and milking the cows. Owing, however, to distaste on his part for this particular kind of work, he gave it up after three weeks, his actual period of service in this capacity having extended from November 23rd to December 14th, 1912. Between these dates, at any rate, he not only helped in milking the cows, but in washing out and cleansing the milk-churns and pails. On taking up this employment he had removed to the farmhouse together with his wife and two children, aged 3 years and $1\frac{3}{4}$ years respectively; and although no longer employed at farm No. 1 at the time of my visit, he was still living there with his family, notwithstanding that a few days previously a statement to the contrary had been made to the Medical Officer of Health. His elder child, a boy, was said to have suffered from diarrhoea about three weeks previously. J. A. G. declared that, at the time of my visit, neither he nor any member of his family had anything whatever to do with the milk business, but under the special circumstances it must be very difficult to exclude possibility of his having given assistance in, say, cleansing of the milk utensils subsequent to the date on which he ceased to milk.

On enquiring into his former history it appeared that more than a year previously, when living at the adjoining village of Ramsay, he had been laid up with "typhoid fever," and I subsequently learnt that he had been medically attended for a period of about a couple of months from September 22nd, 1911, about which time also a number of other cases of enteric fever, all due apparently to infection of the local milk supply, had come under observation.

In view of this history it appeared not improbable that this man, although now in robust health, might be a chronic "carrier" of enteric fever. I therefore explained the matter to him in the presence of Dr. Gurney, the farmer, and Mr. R.,

and asked his consent to the supplying of samples of his blood and excreta for examination, in order to determine whether or not he was in a potentially infectious condition. To this he raised strong objection, asserting that he was perfectly well, and that he was quite certain that he had nothing to do with the fever. I also impressed on Mr. R. the desirability, in his own interest as well as in that of the public health, of stopping the suspected milk supply. This, as he subsequently informed me, was done from January 17th, the milk produced during the next few days being thrown away on the farm land.

Subsequently J. A. G. permitted the withdrawal of a few drops of blood, and he also promised to send on samples of his excreta in bottles which Dr. Cook left with him for the purpose. The blood samples in capillary tubes were at once sent off to Dr. Ledingham at the Lister Institute, who, on the following day, reported by telegram that the blood had given a positive reaction to the Widal test.

Dr. Ledingham also examined the specimens of fæces and urine, supplied by J. A. G., for the presence of the *bacillus typhosus*, but was not successful in isolating this micro-organism. Such failure, however, in view of the positive reaction obtained with his blood, does not necessarily militate against the supposition that he was a carrier of enteric fever, and that he might have been capable of transmitting infective material to the milk supply, say, a couple of months previously, as it is well known that excretion of the specific micro-organism in such cases is apt to be intermittent, the latent periods not infrequently extending over periods of many months. It would doubtless have been more satisfactory to have obtained further samples of excreta for examination, but unfortunately this did not prove feasible.

An interesting sidelight on J. A. G.'s condition of infectivity, during a period antecedent to the recent outbreak of enteric fever in Harwich and Parkeston, is to be found in the fact that the only case of enteric fever notified in the Tendring Rural District outside Parkeston itself, and probably the earliest to suffer attack, was J. A. G.'s brother, notified on December 2nd, 1912. Furthermore, what is probably to be regarded as the first of the Harwich cases, other than those which occurred at Hill Cottages, was that of Rose P., aged 22 years. This woman, notified December 28th, 1912, at the time she came under observation was living in Coke Street, Harwich, to which address, however, she had gone, on December 9th, 1912, from Ramsay, where she had been living with her brother-in-law (George G., brother of J. A. G.) for several weeks previously. The house was opposite to that in which J. A. G. had also been living previous to leaving for farm No. 1 towards the end of November, 1912, and in which he had himself been laid up with enteric fever rather more than a year previously. There is one privy with two seats, common to five cottages, including the two referred to above as occupied by the brothers G. and their families. As this house is at no great distance from the farm, it is reasonable to suppose that—as indeed I was informed had been the case—J. A. G. not infre-

quently paid visits to his relatives living in the village, and in all probability was thus indirectly and unwittingly responsible for their subsequent attack by the disease.

Distribution of Implicated Milk Supply.

Milking at farm No. 1 took place about 4.30 a.m. and again about 1 p.m. each day, about 20 gallons of milk being produced in the morning and from 10-11 gallons in the afternoon. As soon as milking was finished, on either occasion, the milk was transported to farm No. 2, from which it was distributed, with the exception of a small amount which was "separated" in order to obtain cream for butter making. At farm No. 1, where the cows were kept, there was no dairy.

No intentional differentiation was made of milk from one or another of the cows, the pails, as filled, being immediately emptied into the utensils in which they were carried to farm No. 2. Thence, about half the morning supply was despatched to Parkeston, arriving at Parkeston Station at 5.15 a.m. for the supply of the Continental boat trains and the hotel. The greater quantity of that portion of G.'s milk going to Parkeston was supplied under contract to the Great Eastern Railway Company, the actual amount during the year 1912 averaging about 11 gallons per day; or about one-third of G.'s total supply. This amount would be distributed in about the following proportions:—

$1\frac{1}{4}$	gallons	Parkeston Hotel.
$1\frac{3}{4}$	,,	Refreshment Rooms, Parkeston Station.
3	,,	(one gallon each) York, and Hook of Holland, and Antwerp trains restaurant cars.
5	,,	Hook of Holland and Antwerp boats.

11 gallons.

This supply having been delivered the "float" was then driven back to farm No. 2. The driver having changed both horse and cart, left again for a round in Harwich and Dovercourt, so timing his departure as to arrive at the Great Eastern Hotel at Harwich (his first point of call) at about 7 a.m. The amount of milk taken by the hotel, however, was comparatively small, probably never exceeding, as I learnt from the manager, more than one gallon per day. It may be mentioned in passing that no cases of enteric fever have been reported from this hotel, owing, in all probability, to the fact that immediately the first cases were reported in the neighbourhood the manager insisted on all milk brought into the hotel being boiled before use.

As regards the route covered by the remainder of the round in Harwich and Dovercourt, much difficulty was, in the first instance, experienced owing to the refusal of information by the executor of the late owner of the milk business. Eventually, however, a fairly complete list of milk customers was obtained, which

has since been utilised for the purposes of a house-to-house visitation upon customers, in the course of which several "ambulatory" cases of enteric fever, which previously had been overlooked, or treated for some other disease, were discovered.

The demand for G.'s milk appears almost always to have exceeded the available supply, with the result that, practically every day, further quantities had to be purchased from other milk purveyors in order to make up the required amount. During December, 1912, and January of the present year, it appears that 4 gallons per day were purchased from another milk purveyor living near to G.'s farm No. 2, while other smaller amounts were bought, when necessary, by the milkman, from the carts of other milk purveyors during the course of their respective rounds. In view of the lesser incidence of enteric fever on the Harwich and Dovercourt round, as compared with the Parkeston one, it is of interest to note that any additional milk thus purchased from other purveyors was invariably added to the milk distributed to customers in the Harwich and Dovercourt area. The infectiousness of the milk on this particular round would in consequence be likely to be diminished in comparison with that of the milk being simultaneously distributed in Parkeston, as indeed would appear to have been the case.

Milk intended for sale in Parkeston, other than that amount supplied under contract to the Great Eastern Railway each day as described above, was delivered to three small retailers—C., D., and E.—who took $1\frac{1}{2}$, $2\frac{1}{2}$, and 1 gallon of milk per day respectively, by a boy driving a pony and cart. So far as available information goes it does not appear that this boy also supplied casual customers. At an early stage of the outbreak it was rumoured that practically all cases of enteric fever, at Parkeston, had arisen among the customers of D., a suggestion on which much insistence was laid by the representative of the milk purveyor. At my first interview with him he indeed asserted that infection of the milk, if it had occurred at all, was due to local infection as the result, possibly, of specially insanitary conditions believed to obtain on D.'s premises. That grossly insanitary conditions did indeed exist in connection with this particular portion of G.'s milk supply, in Parkeston, became evident on a visit being made there in company with certain of the local officials. But, about the same time, evidence was obtained as to cases of enteric fever having occurred in connection with the consumption of milk bought at a little restaurant kept by C., four cases of the disease occurring on H.M.S. "Cherwell," stationed in Harwich Harbour, having been traced to the consumption of milk from this source. At a later period also C.'s wife and a grown-up son were both notified as suffering from enteric fever.

On the other hand no evidence could be obtained tending to implicate milk sold by E. as having originated cases of the disease. The reason for this apparent exception, however, became obvious when the information was elicited from E. that the milk purchased by him, once daily in the morning only, was invariably boiled immediately on receipt. This was done, as he explained, in order to ensure its remaining "good" when supplied for afternoon teas at the local Golf Club House, of which he was the

manager. The only milk used in his own family was the remainder of the morning's supply, which he took back home after the closing of the golf house for the day, amounting on the average to two or three pints.

At the time of my first visit to Harwich I learnt that the boy who had been driving the milk-cart from whom C., D. and E. obtained their daily supplies was ill with what had been diagnosed as influenza. Dr. Gurney, the Medical Officer of Health, had, I found, taken the precaution to arrange for a specimen of this boy's blood to be sent to the Clinical Research Association, to be examined for the Widal reaction, characteristic of typhoid fever. This they had failed to obtain. On visiting this boy, however, about a week later, he was found to be decidedly ill and weaker, although not confined to bed. Under the circumstances it seemed desirable to obtain further examination of his blood. A specimen was accordingly forwarded to Dr. Ledingham, of the Lister Institute, from whom a telegram was received on the following day to the effect that the blood had given a positive reaction to the Widal test. Examination of a blood sample obtained from the driver of the milk "float" in which milk was taken to the Parkeston Hotel gave a negative result on the only occasion on which it was examined (Clinical Research Association). This man had never shown any indication of ill-health.

Of the Harwich and Dovercourt customers who purchased milk from G., directly or indirectly, a considerable number were also found to be obtaining milk from some other purveyor, usually in the afternoon, when, as previously stated, G.'s available supply was considerably less than in the morning. But no instance came to light of any household in the borough being invaded by enteric fever the inmates of which had not had opportunity of partaking of G.'s milk. In this connection an instructive instance is that of a boy six years of age who, although one of a family of five children, was the only individual in the household attacked by enteric fever. Investigation of the local circumstances elicited the fact that this child, disliking tea, was given at breakfast each day a glass of unboiled milk slightly warmed by the addition of hot water, all the others taking tea. The morning and evening milk supply to this household was found to be obtained from different retailers, but the morning milk was delivered from G.'s milk cart.

Enteric Fever on H.M.S. "Cherwell."

With the co-operation of the naval authorities concerned, I made enquiry as to the occurrence of enteric fever on this ship, one of the 9th destroyer flotilla, stationed in Harwich Harbour. Three definite cases of enteric fever occurred, two out of three officers and one leading seaman being attacked, of whom one of the officers unfortunately died, subsequent to removal to the Royal Naval Hospital, Chatham, and within ten days of his case coming under observation.

H.M.S. "Cherwell" left Harwich for Sheerness on November 20th, 1912, for refitting, returning to Harwich on December

4th. From December 20th-30th, 1912, the officer in command and the leading seaman referred to above were away on leave. The second officer, in the ordinary course, would have gone on leave on December 31st, but, on the morning of December 30th, in consequence of not feeling well, he went on board H.M.S. "St. George" to consult Fleet-Surgeon Mowat, who, finding his temperature above normal, placed him on the sick list. During the next day or two he developed symptoms strongly suggestive of enteric fever. On January 4th the officer in command was also placed on the sick list with somewhat similar symptoms. Enquiry, at the time, showed that he had probably been ill for ten days previously, while on leave. On January 9th, 1913, both of these officers were officially reported as suffering from enteric fever, Fleet-Surgeon Mowat further stating in his report that "a suitable opportunity occurred on January 2nd, 1913, of transferring Sub-Lieutenant Y. to Royal Naval Hospital, Chatham, his general condition warranting this course. No such opportunity presenting for Lieutenant B., he was discharged to Shotley sick-quarters, January 6th, 1913. Every endeavour has been made to trace the source of infection. . . . As Senior Medical Officer I advised a signal being made requesting ships with suspicious cases on board to report them to me, but none have been reported."

On January 10th a further suspicious case (Leading Seaman T.) was reported from H.M.S. "Cherwell." He was transferred to Shotley sick-quarters the same day. On return from leave on December 30th he was thought to be suffering from a cold in the head, and said he had not been feeling well for several days previously. Although his symptoms were somewhat anomalous, a sample of his blood was taken, before his removal to Shotley, and forwarded to Chatham, where, on examination, it was found to give a positive reaction to the Widal test.

In view of the occurrence of these cases of enteric fever a general signal was made to the fleet placing Parkeston, where the disease was also known to have broken out, "out of bounds" until further notice. The "Cherwell" was placed alongside the "St. George," and steps were taken to disinfect the wardroom and cabin of the former by the free use of Izal; beds, blankets, and personal gear being disinfected on board H.M.S. "St. George" in the steam sterilizer.

Samples of water from H.M.S. "Cherwell" were officially forwarded to Greenwich for examination in view of possible infection from this source. On January 12th all the medical officers of the flotilla met in consultation on board H.M.S. "St. George," when the Senior Medical Officer stated that, as the result of investigations, it appeared that "the source of the disease was undoubtedly traceable to Parkeston, and the likelihood was that the infection was conveyed by milk." It was agreed that instructions should be given to officers and men not to partake of un-boiled milk whilst ashore and to avoid uncooked vegetables and shell-fish; further that the same precautions should be taken on board H.M. ships.

The fact that no cases of enteric fever have, so far as is known, occurred on any of the other ships in the flotilla indicate that exceptional circumstances must probably have prevailed in the case of H.M.S. "Cherwell." It was common knowledge that a certain number of cases of enteric fever had occurred, first at Parkeston and subsequently at Harwich and Dovercourt, but, in the first instance, no causal relationship with these cases on shore was obvious.

Milk for the flotilla was either obtained, under contract, from the Model Dairy, Dovercourt, and from a London Contractor, or condensed milk was used. In the case of H.M.S. "Cherwell," however, detailed enquiry eventually elicited the information that on two or three occasions milk had been obtained from one or other of two small retail shops in Parkeston by the wardroom steward, a Maltese, who had gone on shore for the purpose. Great difficulty was at first experienced in arriving at the dates on which these purchases of milk were made in Parkeston, but eventually it was found, by cross-examination of the steward and reference to the ship's log, that on Monday, December 9th, two pints of milk were purchased at C.'s shop at Parkeston, owing to the ordinary supply having run out. This particular date could be fixed in reference to that on which the ship returned from Sheerness, and because, no milk being supplied on Sunday to the ships, it was always on Monday, if at all, that shortage of milk would occur. The next occasion on which milk was obtained from Parkeston was probably December 22nd.

Of the officers and men on board H.M.S. "Cherwell" only one, a leading stoker, had previously suffered from enteric fever. This man had nothing to do with the water or food arrangements of the wardroom mess. The Maltese steward, who has served in the flotilla for the past eight years, stated that he does not take milk himself even in tea. A similar statement, as I am informed, applies to the remaining officer, the only one not attacked by the disease, who, moreover, appears to have been ashore on December 9th. On the other hand, the Lieutenant-Commander, and Leading Seaman T. are said to be fond of milk. As stated elsewhere in this report, the milk retailed by C. at Parkeston was obtained from the farm specially implicated.

The case of the Maltese steward gave rise to considerable difficulty. Through an oversight a specimen of his blood was not sent to Dr. Ledingham for examination so soon as was intended, but on eventually reaching him he reported that it gave a positive Widal reaction. In view of the man's reiterated assertion as to never having been ill and never having taken milk, either alone or in his tea, the result obtained with his blood was difficult of explanation. As, however, it is recognised that the blood of a person who has suffered from Mediterranean or Malta fever may give a positive reaction—more or less marked—to the Widal test, I asked Dr. Ledingham to make further investigation on this point, after having arranged for further samples of the steward's blood to be sent to him for the

purpose. In due course he reported that agglutination tests for Malta fever were entirely negative, whereas the Widal test for typhoid fever again afforded a markedly positive result.

Under these circumstances I communicated once more with Fleet-Surgeon Mowat, R.N., the Senior Medical Officer at Harwich, asking him to make some further investigation in the matter. With this request he at once complied, with the result that, on further interrogation of the steward, he elicited the fact that although the man had never been ill—*i.e.*, had not had to go to the sick bay—he had, to use his own expression, felt “sickified” for three or four mornings at the time that the other patients were feeling ill. His reason for hiding this fact previously was apparently that he is desirous of posing as a man who never gets ill. He maintains, however, that he had no headache, no bleeding from the nose, no diarrhœa, and never was so bad as to have to lie down. He just felt “out of sorts.”

He also now admits that he occasionally drank coffee which was left over from the officers’ mess, and which was more or less cold at the time he drank it. Moreover, it appears that although he boiled the milk for the officers’ coffee, he added *unboiled* milk to that which he drank. Fleet-Surgeon Mowat adds:—“I purposely put my questions so that he should not know what I wanted, and think that I have probably got somewhere near the truth.”

On receipt of this letter I requested Fleet-Surgeon Mowat to forward specimens of the man’s excreta to Dr. Ledingham for bacteriological examination, but as by this time H.M.S. “Cherwell” had been ordered round to Chatham, the authorities there were communicated with, and the steward was temporarily taken into the naval hospital there to admit of the obtaining and examination of the fæces and urine. In reference to the outcome of this investigation a report has since been received in which the definite statement is made that “he (the Maltese steward) is not a ‘carrier’.”

Information has also reached me to the effect that an officer on a ship other than the “Cherwell,” when on shore just before Christmas, drank a glass of milk at the shop in Parkeston at which the milk believed to be responsible for the outbreak of enteric fever on board H.M.S. “Cherwell” was purchased by the Maltese steward. This officer, who states that the occasion was an exceptional one, has not suffered in health in any respect since, but it appears that he passed through an attack of enteric fever two or three years previously. The incident, however, is worthy of mention, since, in the course of my enquiries, I was informed by the proprietor of the shop that officers of the fleet had, on occasion, partaken of milk there.

As the result of detailed enquiries throughout the 8th and 9th flotillas, instituted at my request by Fleet-Surgeon Mowat and Staff-Surgeon Dickinson, it is practically certain that no ship other than the “Cherwell” has obtained milk from Parkeston during the past six months, at any rate.

Hospital Administration.

The Borough of Harwich possesses a small Infectious Diseases Hospital at Dovercourt, the number of beds (16) available at which proved insufficient to cope with the number of cases for which, during the present epidemic of enteric fever in the borough, isolation accommodation was required. In order to meet the difficulty to some extent the Town Council, on my suggestion, undertook to make arrangements for the temporary hire of an empty house for the isolation of patients more or less convalescent from the disease. As, however, it proved impossible to obtain a house for this purpose, a Humphrey's iron hospital block for six beds was put up in the hospital grounds. The Tendring Rural District Council were in much worse case, however, for the reason that they possess no isolation accommodation in their district, notwithstanding that their attention has frequently been directed, by their Medical Officer of Health, to the necessity for providing for the isolation of cases of infectious disease occurring in the district. In consequence, however, of pressure brought to bear by the County Council, the Tendring Rural District Council in May, 1912, came to an arrangement with the Corporation of Colchester to take cases into their Infectious Diseases Hospital at Colchester. Under this arrangement most of the cases of enteric fever notified from Parkeston during December and January, 1912-13, and onwards, have been removed to the Colchester Isolation Hospital for treatment. This has involved the conveyance of each patient a distance of about twenty miles in an ambulance, a circumstance involving not only much discomfort to patients, but considerable risk when they are suffering from enteric fever. In a letter received from Dr. Cook on February 7th last, he gave me the following statement as to the cost incurred by his Council under their agreement in connection with the treatment in Colchester Isolation Hospital of patients attacked by enteric fever during the recent outbreak:—"We have to pay £3 7s. 6d. per week for patients in the Colchester Hospital, besides 5s. for the use of the ambulance, and the cost for horses, which is about 22s. 6d. It is far too much, and our liability per week has been £40 10s. for some weeks past."*

In view of the object-lesson thus afforded as to the difficulty and expense of dealing with a serious outbreak of disease under existing circumstances, it is to be hoped that the Tendring Rural District Council may come to realise the importance of speedily providing efficient isolation accommodation for the needs of their district.

The problem of the "Carrier" Case.

The outbreak of enteric fever dealt with in the present report adds one more to the somewhat rapidly growing list of epidemics traceable to an individual who, whether having previously passed through an acute attack of the disease or not, is yet periodically

* Dr. Cook informs me that, early in March, the weekly sum charged for each patient was reduced to £2 15s.

capable of conveying the disease, directly or indirectly, to other individuals owing to the discharge, in the urine or fæces, of the specific micro-organism of the disease in virulent form.

In the present instance it is obvious that if J. A. G. was such a "carrier" the infection of the milk supply during the period in question can readily be accounted for on the assumption that he introduced infection into the milk by means of his hands during the three weeks he was employed as a milker, and that, in addition, his association with the work of the farm afforded other opportunities by which contamination of the milk with infectious excreta could occur.

The evidence is mainly circumstantial: the carrier is a comparatively young and sturdy individual, apparently in the best of health, who, not unnaturally, strongly resented the suggestion that he could in any way be responsible for the specific infection of the milk, and it was, in consequence, only with the utmost difficulty that a few drops of his blood were obtained for serological examination. For reasons already given, it is impossible to lay much stress on the negative bacteriological result of the single samples of excreta which he was induced to supply.

Under similar circumstances difficulty has not infrequently arisen as to the steps that should be taken to avoid repetition of the danger of infection, through the handling of milk or other food-stuffs, without unnecessarily interfering with the gaining of the "carrier's" livelihood.

In the present instance, as matter of fact, further danger is hardly likely to ensue, for the reasons that, in the first place, the particular milk business in question is no longer in existence, all the stock and utensils employed in connection with it having, as previously stated, been sold by public auction; while, as regards the carrier, himself, his distaste for the work, which led him to throw up his temporary employment as a cowman, before anything was known to be amiss, together with the local notoriety that he has unwittingly attained, are likely to prevent his being offered, or, if offered, accepting, work in a similar capacity again. Fortunately for him, however, he will, as I understand, have no difficulty in earning his living at farm-work other than that involving the care of cattle.

In concluding this report, I desire to express my thanks to all those who have assisted me in the necessary investigations, among whom I would specially mention the Town Clerk of Harwich, Mr. Ward; Fleet-Surgeon J. Mowat, R.N.; the Medical Officers of Health to the Borough of Harwich (Dr. Gurney), and to the Tendring Rural District Council (Dr. Cook); and the Borough Surveyor and Inspector of Nuisances (Mr. French), whose accurate knowledge of the local circumstances of his district proved most serviceable.

S. MONCKTON COPEMAN.
